

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Inventor: Hiroaki SUDO Art Unit 2617
Appln. No.: 10/502,091 Exr. C. Brandt
Filed: July 22, 2004 Conf. No. 4015
For: OFDM-CDMA TRANSMITTING APPARATUS AND OFDM-CDMA TRANSMITTING METHOD

RESPONSE UNDER 37 CFR § 1.116

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Final Rejection dated July 10, 2008, the Applicant respectfully requests reconsideration and allowance of the application in light of the following remarks.

Claims 1-9, 13-18, 20, 21, 28, and 29 stand rejected, under 35 USC §103(a), as being unpatentable over Walton et al. (US 2003/0081538) in view of Arai et al. (US 6,456,607) and Sakoda et al. (US 2002/0118659). Claims 23-27 stand rejected, under 35 USC §103(a), as being unpatentable over Walton et al. (US 2003/0081538) in view of Arai et al. (US 6,456,607), Sakoda et al. (US 2002/0118659), and Hwang (US 2002/0060997). The Applicant respectfully traverses these rejections as follows.

Claim 1 defines an OFDM-CDMA transmitting apparatus that varies a subcarrier group, to which spread signals of multiplexed transmit symbols are distributed, in accordance with a spreading ratio applied to a group of the transmit symbols. The claimed subject matter supports

selecting the spreading ratio of data and the amount of multiplexing applied to the spread data so as to achieve compatibility between spectral efficiency and error rate characteristics (see specification page 5, lines 11-28). (References herein to the specification and drawings are for illustrative purposes only and are not intended to limit the scope of the invention to the referenced embodiments.)

The Final Rejection acknowledges that Walton and Arai do not teach or suggest the Applicant's claimed subject matter of adjusting a frequency band to which multiplexed spread signals are transmitted by distributing the multiplexed spread signals to a plurality of subcarriers and varying a subcarrier group to which spread signals of multiplexed specific transmit symbols are distributed in accordance with a spreading ratio (see Final Rejection page 4, second to last paragraph). To overcome this deficiency, the Final Rejection proposes that Sakoda discloses this subject matter (see paragraph bridging pages 4 and 5), and more specifically, the Final Rejection proposes that Sakoda discloses frequency converting a transmission signal into a desired frequency band of multi-carrier communication (see page 5, first paragraph).

However, the Applicant notes that Sakoda does not disclose varying the number of subcarriers or the particular group of subcarriers used to communicate a transmission signal in accordance with a spreading ratio applied to a group of symbols within the transmission signal. Instead, Sakoda seems to disclose varying a center frequency and spectral bandwidth in accordance with a communication parameter (see Sakoda paragraphs [0154]-[0155]). Thus, Sakoda does not disclose the claimed subject matter of varying a subcarrier group to which spread and multiplexed symbols are distributed in accordance with a spreading ratio applied to a portion of the spread and multiplexed symbols.

Accordingly, the Applicant submits that the teachings of Walton, Arai, and Sakoda, considered individually or in combination, do not render obvious the subject matter defined by claim 1. Independent claims 21, 28, and 29 similarly recite the above-mentioned subject matter distinguishing apparatus claim 1 from the applied references, but claims 21 and 29 do so with respect to methods. In addition, claims 28 and 29 specifically recite distributing spreading signals of multiplexed transmit symbols to the frequency and time domains in accordance with the spreading ratio rather than, as recited in claims 1 and 21, varying a subcarrier group to which spread signals of multiplexed transmit symbols are distributed in accordance with the spreading ratio. Therefore, the Applicant respectfully submits that the rejections applied to claims 23-27 are obviated, and allowance of claims 1, 21, 28, and 29 and all claims dependent therefrom is warranted.

To promote a better understanding of the differences between the claimed subject matter and the applied references, the Applicant provides the following additional remarks.

Features of claims 1 and 21 include adjusting a frequency band to which multiplexed spread signals are transmitted by varying a subcarrier group to which spread signals of the multiplexed specific transmit symbols are distributed in accordance with a first spreading ratio, upon distributing the multiplexed spread signals to a plurality of subcarriers. Features of claims 28 and 29 include distributing spreading signals of the multiplexed specific transmit symbols to the frequency domain and time domain in accordance with a first spreading ratio, upon distributing multiplexed spread signals to a plurality of subcarriers.

It is submitted that Walton, Arai, and Sakoda, taken alone or together, do not disclose or suggest the above-described features.

Although Sakoda discloses the relationships between transmission rates and spreading ratios and the relationships between transmission rates and frequency bands (see Sakoda paragraphs [0051]-[0155]), Sakoda does not disclose relationships between spreading ratios and frequency bands. That is, as a specific example of the relationships between transmission rates and spreading ratios, Sakoda discloses a spread-code multiplier 104 that generates a transmission symbol stream S103 of 256K [chips/sec] using methods of: (1) multiplying an information bit stream of 64K [coded bits/sec] by a spread code C21 of a spreading ratio of 4 when an information bit stream of 64K [coded bits/sec] is inputted; (2) multiplying an information bit stream of 128K [coded bits/sec] by spread code C21 of a spreading ratio of 2 when an information bit stream of 128K [coded bits/sec] is inputted; (3) multiplying an information bit stream of 192K [coded bits/sec] by spread code C21 of a spreading ratio of 1 when an information bit stream of 192K [coded bits/sec] is inputted; and (4) multiplying an information bit stream of 256K [coded bits/sec] by spread code C21 of a spreading ratio of 1 when an information bit stream of 256K [coded bits/sec] is inputted.

Further, as a specific example, Sakoda discloses a transmitting circuit 108 that performs transmission through a communication channel of 100 [kHz] when reading an information bit stream of 32K [bits/sec] from a buffer 101, performs transmission through a communication channel of 200 [kHz] when reading an information bit stream of 64K [bits/sec] from buffer 101, performs transmission through a communication channel of 300 [kHz] when reading an information bit stream of 96K [bits/sec] from buffer 101, and performs transmission through a communication channel of 400 [kHz] when reading an information bit stream of 128K [bits/sec] from buffer 101.

However, the above-noted processing in spread-code multiplier 104 and the above-noted processing in transmission circuit 108 are performed separately and are not related. Therefore, Sakoda does not disclose or suggest adjusting a frequency band in accordance with the spreading ratio.

Further, Sakoda's paragraph [0148], cited in the Final Rejection, merely discloses frequency-converting a transmission signal into a desired frequency band and fails to disclose a relationship between a spreading ratio and a frequency band. And Sakoda's paragraph [0177], cited in the Final Rejection, merely discloses performing multiplication by using only a spread code C55 having a single type of spreading ratio (SP) of 32. Therefore, in this case, with one type of a spreading code, it is not possible to adjust a frequency band in accordance with the spreading ratio.

As described above, Sakoda discloses varying the frequency band regardless of the spreading ratio, and so fails to disclose making the frequency band wide by enlarging the spreading ratio to control frequency use efficiency and error rate characteristics. The Final Rejection acknowledges that Walton and Arai do not disclose the above-noted features of the claimed invention.

With regard to claims 28 and 29, the cited references merely disclose distributing signals to a frequency domain and fail to disclose or suggest distributing spread signals to a frequency domain and time domain in accordance with the spreading ratio.

In view of the above, it is submitted that this application is in condition for allowance and a notice to that effect is respectfully solicited.

If any issues remain which may best be resolved through a telephone communication, the Examiner is requested to telephone the undersigned at the local Washington, D.C. telephone number listed below.

Respectfully submitted,

/James Edward Ledbetter/

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JEL/DWW/att

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